AePW-3 Telecon

November 5, 2020

Agenda: November 5, 2020

- AePW-3 Website / Schedule / SciTech 2021 / Organizing Committee
- AePW-3 group telecons are held on first Thursday each month
- Large Deflection Working Group, Markus Ritter
  - Telecons are held on second Thursday each month.
- X-56 Flight Test Working Group, Alex Chin
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- Special Presentation, Grand Challenge, by Jeff Slotnick, Boeing
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AePW-3 Website / Schedule / Calendar / SciTech 2021 / Organizing Committee

- Microsoft TEAMs platform. We are deleting old Webex meeting invitation. Please update your calendars.
- AePW-3 website: https://nescacademy.nasa.gov/workshops/AePW3/public/
- SciTech2021

Co-Chair, Markus Ritter
Session: SD-24, Special Session: Progress of the 3rd Aeroelastic Prediction Workshop Large Deflection Group
Session: Special Session: Progress of the 3rd Aeroelastic Prediction Workshop Large Deflection Group
Session Type: Technical Paper Session
Date: 20-Jan-2021
Start Time: 10:00 AM
End Time: 11:15 AM
Location: VR09

here's the detailed list of presenters (just copied it from the corresponding AIAA session information). Of course the information may change within the next weeks, I'll send you an update if something is updated.

FINAL ID	Control ID	PRESENTATION TYPE	TITLE	PRESENTER	MANUSCRIPT SUBMISSION STATUS	MANUSCRIPT SUBMISSION DEADLINE	Presenter Email
N/A	3455730	Technical Paper (Work in Progress)	An Experimental Benchmark of a Very FlexibleWing	Or Avin	Awaiting Response (as of 30-Oct-2020)	01-Dez-2020, 8:00 PM	Avinos24@gmail.com
N/A	3456228	Technical Paper (Completed Research)	Nonlinear Aeroelastic Analysis of Very Flexible Wings Using the Modal Rotation Method	Ariel Drachinsky	Awaiting Response (as of 30-Oct-2020)	01-Dez-2020, 8:00 PM	arikdra@gmail.com
N/A	3456589	Technical Paper (Work in Progress)	Flutter predictions for very flexible wing wind tunnel test	Norberto Goizueta	Awaiting Response (as of 30-Oct-2020)	01-Dez-2020, 8:00 PM	norberto.goizueta13@imperial.ac.uk
N/A	3456900	Technical Paper (Work in Progress)	UM/NAST Experimental Validation Using the Pazy Wing Aeroelastic Benchmark	Cristina Riso	Awaiting Response (as of 30-Oct-2020)	01-Dez-2020, 8:00 PM	criso@umich.edu
N/A	3458490	Technical Paper (Work in Progress)	Static and Dynamic Simulations of the Pazy Wing Aeroelastic Benchmark by Nonlinear Potential Aerodynamics and detailed FE Model	Markus Ritter	Awaiting Response (as of 30-Oct-2020)	01-Dez-2020, 8:00 PM	markus.ritter@dlr.de

  - Grand Challenge, Special Session
- Organizing Committee

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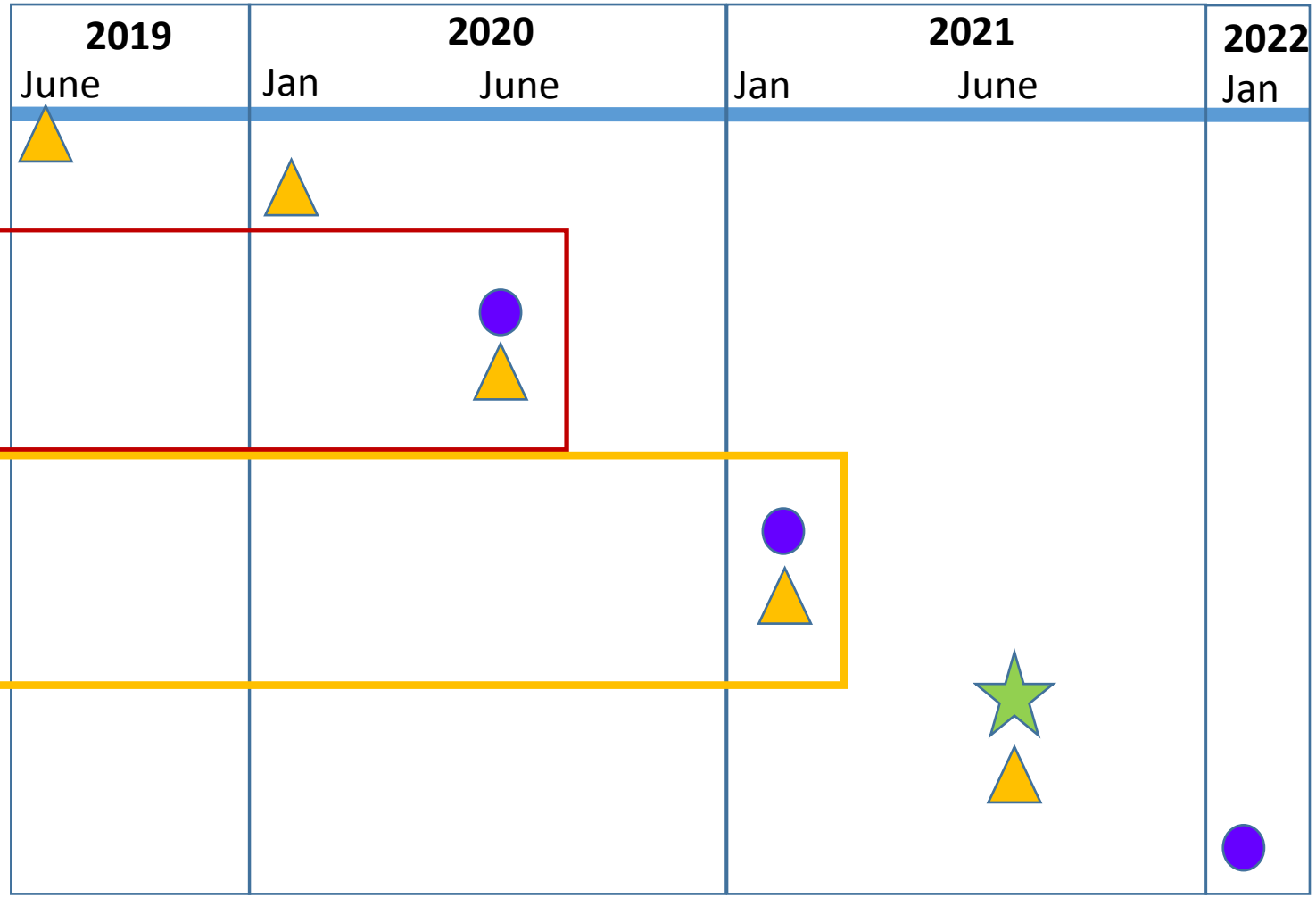
Toward the next Aeroelastic Prediction Workshop (AePW-3): Requesting Conference-Associated Support

Requesting Co-sponsoring between Structural Dynamics TC & Applied Aerodynamics TC:
- **Specific SDTC items are in Blue**
- **Specific APATC items are in Green**

- IFASD 2019 Discussion Session
- SciTech 2020 Evening Discussion Sessions
- Aviation 2020
  - **Special session on Large Deflection FSI (oral presentations only) canceled!!!**
  - ~~Evening discussion sessions: Kick off meetings for AePW-3~~ → **Canceled**
- SciTech 2021
  - Special session reporting intermediate results (oral presentations only)
  - Evening discussion sessions for collaboration among participants
- Aviation 2021 and/or IFASD 2021
  - AePW-3 (oral presentations only)
  - Evening discussion session to debrief workshop(s)
- SciTech 2022 Special sessions on results (technical publications & presentations)



Agenda: November 5, 2020

- Special Presentation, Grand Challenge, by Jeff Slotnick, Boeing

- We have a special session at Scitech 2021 under the topic: CFD2030. It actually shows up as a separate Technical Discipline
- We held a Forum 360 on Grand Challenge problems at Aviation 2020 as a precursor to this paper session.
- Our paper session will have 3 papers presented live, one for each Grand Challenge problem, and we will hold a live discussion panel session to gather feedback on the GC problems.
- The 3 papers to be presented are as follows:
- 1: "*A Grand Challenge for the Advancement of Numerical Prediction of High Lift Aerodynamics*", Jeff Slotnick (Boeing) and Dimitri Mavriplis(University of Wyoming)
- 2: "*Vision 2030 Aircraft Propulsion Grand Challenge Problem: Full-engine CFD Simulations with High Geometric Fidelity and Physics Accuracy*", M.S. Anand, (Rolls-Royce USA), G.M. Laskowski (Dassault Systemes), K.L. Suder (NASA Glenn), G. Medic (Raytheon Technologies Research Ctr), U. Paliath(GE Research Ctr).
- 3: "*CFD 2030 Grand Challenge: CFD-in-the-Loop Monte Carlo Flight Simulation for Space Vehicle Design*", David Schuster (NASA Langley)
- All this is being done under the auspices of the CFD2030 Integration Committee.
- The CFD2030 sponsored events are listed at our web site: [cfd2030.com](cfd2030.com)

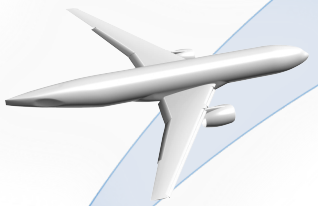
Advancing High Lift Aerodynamic Prediction
Series of Technical Challenges

Focus on key technical obstacles for specific time periods to make progress towards solving the grand challenge

Ground-Based Experimental Testing

FLOW PHYSICS PREDICTION

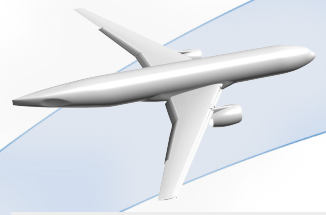
Sub-Challenge #1
1-3 years



Representative WT Geometry
Landing/TO configuration + nacelle/pylon
Re effects (atmospheric, pressurized, cryogenic environments)
Interactional flow physics (separation, vortex flow)
Static aeroelastics

CFD-generated data compared to WT data

Sub-Challenge #2
3-6 years



Representative WT Geometry
S&C (tail/control surfaces/trim)
Cross-flow effects
Engine propulsion effects
Ice effects

CFD-generated data compared to WT data

Sub-Challenge #3
6-10+ years

LOW-SPEED WIND-UP TURN

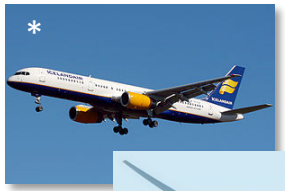
Generic Flight Vehicle
Sub- or full-scale flight geometry
Flight Re
Quasi-steady flight
Basic maneuver
Dynamic structural response

CFD-generated data at specific points in the maneuver trajectory compared directly with flight-derived data

* Potential flight test vehicle configuration

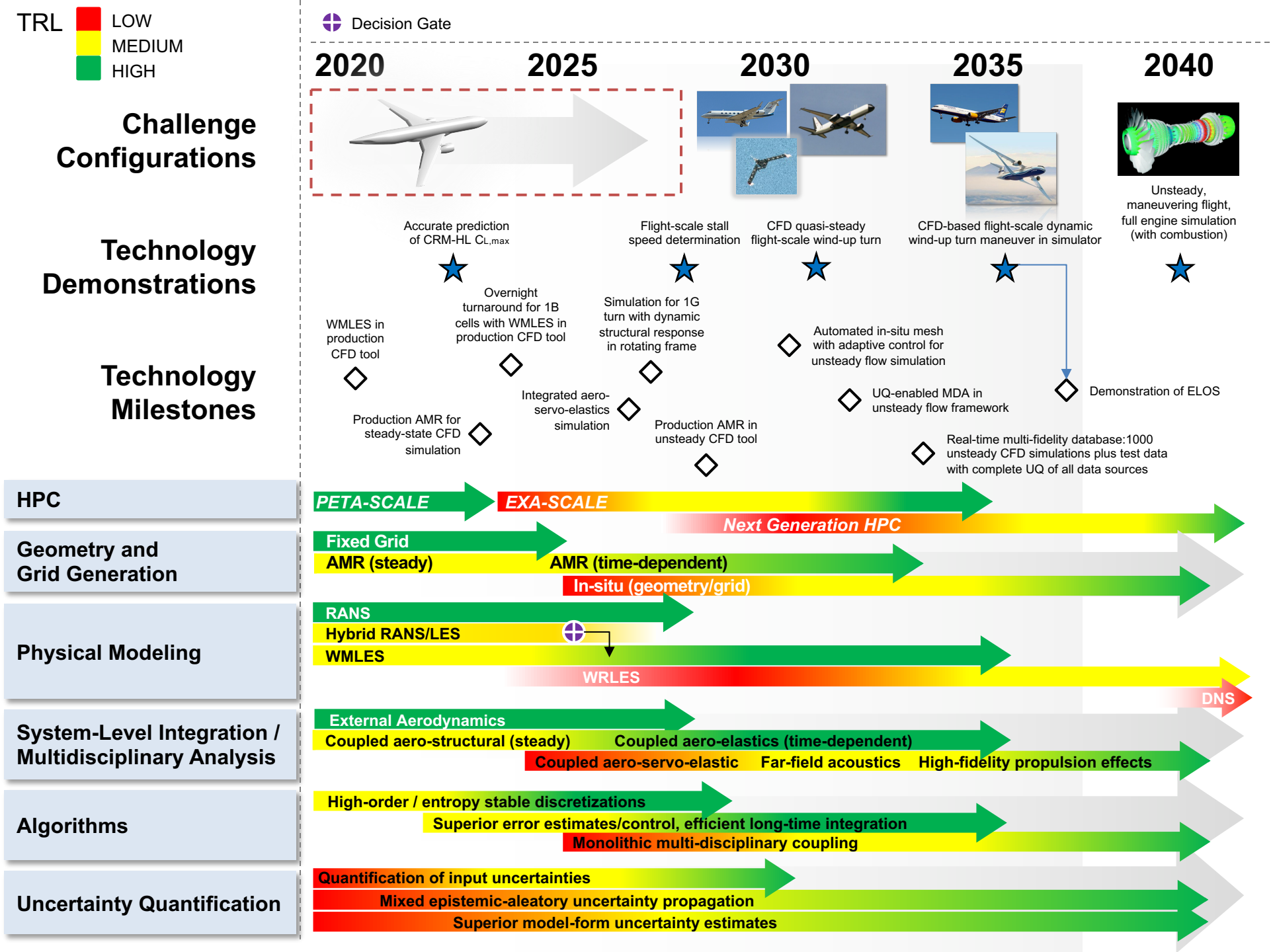
Grand Challenge
15+ years

LOW-SPEED WIND-UP TURN



Generic Flight Vehicle
Full scale flight geometry
Flight Re
Dynamic, maneuvering flight
Dynamic structural/system response
Environmental effects
Engine power effects

Data from numerical simulation of the dynamic maneuver fed into CFD-based flight simulation, then proof-of-match between flight simulation and flight experience


TRL
LOW
MEDIUM
HIGH
Decision Gate
2020
2025
2030
2035
2040
Challenge Configurations
Technology Demonstrations
Technology Milestones
Unsteady, maneuvering flight, full engine simulation (with combustion)
Accurate prediction of CRM-HL CL,max
Flight-scale stall speed determination
CFD quasi-steady flight-scale wind-up turn
CFD-based flight-scale dynamic wind-up turn maneuver in simulator
WMLES in production CFD tool
Overnight turnaround for 1B cells with WMLES in production CFD tool
Simulation for 1G turn with dynamic structural response in rotating frame
Automated in-situ mesh with adaptive control for unsteady flow simulation
Demonstration of ELOS
UQ-enabled MDA in unsteady flow framework
Integrated aero-servo-elastics simulation
Production AMR for steady-state CFD simulation
Production AMR in unsteady CFD tool
Real-time multi-fidelity database:1000 unsteady CFD simulations plus test data with complete UQ of all data sources
HPC
PETA-SCALE
EXA-SCALE
Next Generation HPC
Geometry and Grid Generation
Fixed Grid
AMR (steady)
AMR (time-dependent)
In-situ (geometry/grid)
Physical Modeling
RANS
Hybrid RANS/LES
WMLES
WRLES
DNS
System-Level Integration / Multidisciplinary Analysis
External Aerodynamics
Coupled aero-structural (steady)
Coupled aero-elastics (time-dependent)
Coupled aero-servo-elastic
Far-field acoustics
High-fidelity propulsion effects
Algorithms
High-order / entropy stable discretizations
Superior error estimates/control, efficient long-time integration
Monolithic multi-disciplinary coupling
Uncertainty Quantification
Quantification of input uncertainties
Mixed epistemic-aleatory uncertainty propagation
Superior model-form uncertainty estimates